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Docket No. RRA-101T
Serial No. 10/810,763In the Claims

Claims 1-61 (canceled).

Claim 62 (currently amended). A method of processing colloidal size polytetrafluoroethylene resin particles by plug flow in an unmelted state while in a hydrostatic coalescible condition to produce biaxially-planar oriented structures comprising the steps of:

a. releasing said colloidal size polytetrafluoroethylene resin particles from coagulated dispersion aggregates at high shear in a solvent to create a mixture, wherein said particles are approximately 5 to 10 microns in size and said solvent is capable of wetting polytetrafluoroethylene surfaces;

b. subjecting said mixture to high shear mixing;

c. filtering said mixture to retain approximately 17 to 20 percent liquid to form a hydrostatic pressure coalescible filter cake;

d. processing said filter cake, said processing step comprising

i) first uniaxially paste extruding said filter cake composition to produce a uniaxial planar oriented polytetrafluoroethylene structure having longitudinal stress containing approximately 17 to 20 percent lubricant; and

e. — ii) applying a means of re-orienting said uniaxially planar oriented polytetrafluoroethylene structure containing approximately 17 to 20 percent lubricant approximately 90 degrees to the initial uniaxial extrusion direction, wherein said means of re-orienting imparts a transverse stress to said structure, wherein said means of re-orienting comprises a single step of re-orientation for a sufficient period of time so that the transverse stress imparted by said re-orienting and the longitudinal stress imparted by said uniaxial paste extrusion are about equal.

Claim 63 (previously presented). The method of claim 62 wherein the means of re-orienting is rolling.

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Claim 64 (previously presented). The method of claim 62 wherein said means of re-orienting is calendering.

Claim 65 (previously presented). The method of claim 62 wherein the means of re-orienting is blowing.

Claim 66 (previously presented). The method of claim 62 wherein the means of re-orienting is re-extrusion.

Claim 67 (previously presented). The method of claim 62 wherein said biaxial planar oriented polytetrafluoroethylene structure is a sheet.

Claim 68 (previously presented). The method of claim 62 wherein biaxial planar oriented polytetrafluoroethylene structure is a tube.

Claim 69 (currently amended). The method of claim 68 further comprising steps after step f of:

- ~~g-e)~~ slitting said biaxial planar oriented polytetrafluoroethylene tubular structure; and
- ~~h-f)~~ laying open said structure to form a sheet.

Claim 70 (previously presented). The method of claim 62 further comprising the step after step b of:

- c. adding solid particles approximately less than 25 microns in size during mixing to consist of up to 90 percent of a total solids volume.

Claim 71 (currently amended). A biaxially planar oriented structure formed by releasing said colloidal size polytetrafluoroethylene resin particles from coagulated dispersion aggregates at high shear in a solvent to create a mixture, wherein said particles are approximately 5 to 10 microns in size and said solvent is capable of wetting polytetrafluoroethylene surfaces; subjecting said mixture

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to high shear mixing; adding solid particles approximately less than 25 microns in size during mixing to consist of up to 90 percent of a total solids volume; filtering said mixture to retain approximately 17 to 20 percent liquid to form a hydrostatic pressure coalescible filter cake; and processing said filter cake, said processing comprising i) first uniaxially paste extruding said filter cake composition to produce a uniaxial planar oriented polytetrafluoroethylene structure having longitudinal stress containing approximately 17 to 20 percent lubricant; and ii) applying a means of re-orienting said uniaxially planar oriented polytetrafluoroethylene structure containing approximately 17 to 20 percent lubricant approximately 90 degrees to the initial uniaxial extrusion direction wherein:

said means of re-orienting imparts a transverse stress to said structure; and said means of re-orienting is a single step of rolling for a sufficient period of time so that the transverse stress imparted by said re-orienting and the longitudinal stress imparted by said uniaxial paste extrusion are about equal.

Claim 72 (currently amended). A biaxially planar oriented structure formed by releasing said colloidal size polytetrafluoroethylene resin particles from coagulated dispersion aggregates at high shear in a solvent to create a mixture, wherein said particles are approximately 5 to 10 microns in size and said solvent is capable of wetting polytetrafluoroethylene surfaces; subjecting said mixture to high shear mixing; adding solid particles approximately less than 25 microns in size during mixing to consist of up to 90 percent of a total solids volume; filtering said mixture to retain approximately 17 to 20 percent liquid to form a hydrostatic pressure coalescible filter cake; and processing said filter cake, said processing comprising i) first uniaxially paste extruding said filter cake composition to produce a uniaxial planar oriented polytetrafluoroethylene structure having longitudinal stress containing approximately 17 to 20 percent lubricant; and ii) applying a means of re-orienting said uniaxially planar oriented polytetrafluoroethylene structure containing approximately 17 to 20 percent lubricant approximately 90 degrees to the initial uniaxial extrusion direction wherein:

said means of re-orienting imparts a transverse stress to said structure; and said means of re-orienting is a single step of calendering for a sufficient period of time so that the transverse stress

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imparted by said re-orienting and the longitudinal stress imparted by said uniaxial paste extrusion are about equal.

Claim 73 (currently amended). A biaxially planar oriented structure formed by releasing said colloidal size polytetrafluoroethylene resin particles from coagulated dispersion aggregates at high shear in a solvent to create a mixture, wherein said particles are approximately 5 to 10 microns in size and said solvent is capable of wetting polytetrafluoroethylene surfaces; subjecting said mixture to high shear mixing; adding solid particles approximately less than 25 microns in size during mixing to consist of up to 90 percent of a total solids volume; filtering said mixture to retain approximately 17 to 20 percent liquid to form a hydrostatic pressure coalescible filter cake; and processing said filter cake, said processing comprising i) first uniaxially paste extruding said filter cake composition to produce a uniaxial planar oriented polytetrafluoroethylene structure having longitudinal stress containing approximately 17 to 20 percent lubricant, and ii) applying a means of re-orienting said uniaxially planar oriented polytetrafluoroethylene structure containing approximately 17 to 20 percent lubricant approximately 90 degrees to the initial uniaxial extrusion direction wherein:

said means of re-orienting imparts a transverse stress to said structure; and said means of re-orienting is a single step of re-extrusion for a sufficient period of time so that the transverse stress imparted by said re-orienting and the longitudinal stress imparted by said uniaxial paste extrusion are about equal.

Claim 74 (previously presented). The biaxially planar oriented structure of claim 71 further comprising at least one electrically conductive particulate.

Claim 75 (currently amended). The biaxially planar oriented structure of claim 74 wherein:
said at least one electrically conductive particulate is selected from a group consisting of carbon, graphite and ceramic oxides.

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Claim 76 (previously presented). The biaxially planar oriented structure of claim 71 further comprising:
inert particles.

Claim 77 (previously presented). The biaxially planar oriented structure of claim 72 further comprising:
inert particles.

Claim 78 (previously presented). The biaxially planar oriented structure of claim 73 further comprising:
inert particles.

Claim 79 (previously presented). The biaxially planar oriented structure of claim 71 further comprising polymeric resin particles.

Claim 80 (previously presented). The biaxially planar oriented structure of claim 72 further comprising polymeric resin particles.

Claim 81 (previously presented). The biaxially planar oriented structure of claim 73 further comprising polymeric resin particles.

Claim 82 (currently amended). The method of claim 67 wherein said subjecting step further comprises adding solid particles approximately less than 25 microns in size during mixing to consist of up to 90 percent of a total solids volume, said means of re-orienting is rolling; and, further comprising a step after step b of:

e. ~~adding solid particles approximately less than 25 microns in size during mixing to consist of up to 90 percent of a total solids volume; and further comprising a step after step f of:~~

g. laminating said rolled biaxial planar oriented polytetrafluoroethylene structure by compression.

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Claim 83 (currently amended). The method of claim 67 wherein said means of re-orienting is calendering, ~~further comprising the step after step b of wherein said subjecting step further comprises~~ adding solid particulates approximately less than 25 microns in size during mixing to consist of up to 90 percent of a total solids volume, ~~further comprising the step after step f of and~~ laminating said calendered biaxial planar oriented polytetrafluoroethylene structure by compression.

Claim 84 (currently amended). The method of claim 67 wherein said means of re-orienting is re-extrusion, ~~further comprising the step after step b of wherein said subjecting step further comprises~~ adding solid particulates approximately less than 25 microns in size during mixing to consist of up to 90 percent of a total solids volume, ~~further comprising the step after step f of and~~ laminating said re-extruded biaxial planar oriented polytetrafluoroethylene structure by compression.

Claim 85 (previously presented). The method of claim 82 wherein said compression is at a pressure ranging from 100 to 1,000 psi.

Claim 86 (previously presented). The method of claim 83 wherein said compression is at a pressure ranging from 100 to 1,000 psi.

Claim 87 (previously presented). The method of claim 84 wherein said compression is at a pressure ranging from 100 to 1,000 psi.

Claim 88 (currently amended). The method of claim 82 further comprising ~~a step after step h~~ of:
i. ~~applying heat up to 300 degrees Centigrade to the laminated, rolled biaxial planar oriented PTFE structure~~ to plasticize and assist the forming and shaping of the sheet.

Claim 89 (currently amended) The method of claim 83 further comprising ~~a step after step h~~ of:

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ii. ~~applying heat up to 300 degrees Centigrade to the laminated, calendered biaxial planar oriented PTFE structure to plasticize and assist the forming and shaping of the sheet.~~

Claims 90-95 (canceled).

Claim 96 (currently amended). ~~A porous biaxially planar oriented polytetrafluoroethylene matrix structure structures employing the principles of claim 70 employing the fabrication methods of claims 63, 64, 66, 67 and 68 and 82—90 wherein the particulate components are fugitive and added during claim 70 as part c; said fugitive pore formers are removable by prepared according to the steps comprising:~~

~~a) releasing colloidal size polytetrafluoroethylene resin particles from coagulated dispersion aggregates at high shear in a solvent to create a mixture, wherein said particles are approximately 5 to 10 microns in size and said solvent is capable of wetting polytetrafluoroethylene surfaces;~~

~~b) subjecting said mixture to high shear mixing;~~

~~c) adding solid, fugitive particulates to said mixture during said high shear mixing until said mixture comprises about 90% total solids volume, wherein said particulates comprise (up to) about 25 microns in size;~~

~~d) filtering said mixture to retain about 17% to about 20% liquid to form a hydrostatic pressure coalescible filter cake;~~

~~e) processing said filter cake, said processing step comprising i) first uniaxially paste extruding said filter cake, whereby a uniaxial planar oriented polytetrafluoroethylene structure comprising about 17% to about 20% solvent having longitudinal stress is extruded, and ii) applying a means for re-orienting said uniaxial planar oriented polytetrafluoroethylene structure about 90° to the initial uniaxial direction, wherein said re-orienting means comprises a single step of rolling, calendaring, or extrusion of re-orientation that imparts a transverse stress for a sufficient period of time so that the transverse stress and the longitudinal stress imparted by said uniaxial paste extrusion are about equal;~~

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g) laminating said biaxial planar oriented polytetrafluoroethylene structure by compression; wherein said compression comprises applying pressure within the range of about 100 psi to about 1,000 psi;

i) applying heat to said biaxial planar oriented polytetrafluoroethylene structure; and

j) removing said solid, fugitive particulates by dissolving in water (such as sodium chloride), chemical reaction (such as hydrochloric acid on calcium carbonate) or by thermal decomposition during sintering (such as methyl methacrylate);
wherein said structure is a sheet having porosities of up to 90 percent are possible.

Claim 97 (currently amended). ~~Biaxially~~ The biaxially planar oriented porous structures according to ~~of~~ claim 96 comprising at least one fugitive pore former.

Claim 98 (currently amended). ~~Biaxially~~ The biaxially planar oriented porous structures according to ~~of~~ claim 96 containing a ceramic oxide, carbon or graphite ~~(all electrically conductive materials).~~

Claim 99 (currently amended). ~~The method~~ biaxially planar oriented porous structures of claims 96 and 97 wherein the fugitive pore former additive particle size determines the resulting pore size.

Claim 100 (previously presented). A porous membrane structure of biaxially planar oriented polytetrafluoroethylene of claim 96 wherein the structure contains polymeric particulate additives.

Claim 101 (currently amended). An asymmetric porous structure of biaxially planar orientated polytetrafluoroethylene prepared according to the steps of:

a) releasing said colloidal size polytetrafluoroethylene resin particles from coagulated dispersion aggregates at high shear in a solvent to create a mixture, wherein said particles are approximately 5 to 10 microns in size and said solvent is capable of wetting polytetrafluoroethylene surfaces;

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b) subjecting said mixture to high shear mixing;

c) filtering said mixture to retain approximately 17 to 20 percent liquid to form a hydrostatic pressure coalescible filter cake;

d) processing said filter cake, said processing step comprising i) first uniaxially paste extruding said filter cake composition to produce a uniaxial planar oriented polytetrafluoroethylene structure having longitudinal stress containing approximately 17 to 20 percent lubricant, and ii) applying a means of re-orienting said uniaxially planar oriented polytetrafluoroethylene structure containing approximately 17 to 20 percent lubricant approximately 90 degrees to the initial uniaxial extrusion direction, wherein said means of re-orienting comprises a single step of re-orientation that imparts a transverse stress for a sufficient period of time so that the transverse stress and the longitudinal stress imparted by said uniaxial paste extrusion are about equal; wherein two fugitive pore formers are added during said extruding step and said re-orienting step, wherein said pore formers comprise two different particle sizes;

e) drying and then sintering the fabricated structure at a temperature above 342 °C and not to exceed 400 °C; and

f) removing said pore formers by dissolving said pore formers in water, by chemical reaction, or by thermal decomposition accomplished during steps d and e of claim 62 employing two different particle size fugitive pore formers as in claims 97-99 added in steps d and e of claim 62; processing said composition according to claim 66; concluded by sintering said structure as in claim 91; removing fugitive pore former by leaching or chemical reaction as in claim 96.

Claims 102-106 (canceled).

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